M/035/0002
TASK 3321
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December 21, 2009

Attn: Paul Baker, Minerals Regulatory Program
Leslie Heppler, Minerals Regulatory Program

Re: M/035/002 – Bingham Canyon Mine
May 12, 2008 Order Vacating NOV #N2007-58-01
Waste Rock Stability Study and Results of DAN-W
Submittal of Revised Documents
Submittal of *FILE 01A - Rev2009 – 10 KUC Comment Response Table UDOGM (Rev 2009-12-210)*

Dear Ms. Dean:

Please find attached the above noted revised *FILE 01A - Rev2009 – 10 KUC Comment Response Table UDOGM* previously included with our submittal dated November 11, 2009. KUC inadvertently submitted on that date a version of FILE 01A that included a few typographical, formatting, and content errors. These issues have been addressed and corrected on the attached version.

Please contact me or Zeb Kenyon at 801-569-6035, should you have any questions concerning this submittal.

Sincerely,

Chris Kaiser
Principal Advisor
Environmental Operations Support

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Comment #	Sheet/Page/ Map/Table #	UDAQ Comments	Kennecott Response
3	Page 9 Para 2	Expand the paragraph to include more information about the foundation conditions of the alluvial filled drainages. DOGM is satisfied with the summary described of the foundation conditions of the ridges.	Added Reference to Table A-2 – Summary of Foundation Soil Types below South End Drainages. Corrected / modified Table A-2 to show more detail of the actual investigations data available within the drainages. However, the reader is referenced to the actual explorations that are available within the drainages and Table A-2 has been annotated to correspond more closely with the AMEC boring logs (versus a compilation of the AMEC and NAE descriptions provided previously.) Also note that in general NAE found gravel soils in the exposed slope cuts and shallow test pits, whereas clay soils were only encountered at depth within a few AMEC borings.
4	Page 10 Para 3	As noted in comment 1 listed above, include more detail about the low friction angle (less than 24 and 11 degrees listed) clay soil deposits; include possible size of deposits, extrapolation of clay soil material to areas which can't be accessed, and impact on the FOS in those areas.	The very weak clay soils are expected to be residual materials derived from the underlying volcanic bedrock, which occurs as "bands" of outcrops shown on Figure A-2. In all cases, the materials vary from clayey gravel to gravelly clay. Therefore the lowest friction angle used in the analysis is the clay strength. The actual friction and cohesion values used are clarified in the Tables.

5	Appendix A	Foundation Conditions – The appendix is a compilation of several recent detailed studies and notes low friction angle soils below the dumps, but not much is compiled from the historic data underlying the dumps. Figure A-3 notes a "previous slide area" in the Saints Rest drainage, yet table A-4 indicates the CH-Plastic Clays in Olsen Gulch. This seems like an incomplete thought. Table A-5 also indicates high plastic clays. Is there any extrapolation of the clay soil material to areas that can't be accessed and the impact on the FOS in those areas of historic failures and susceptible soils?	The previous Figure A-3 has been replaced. The previous Figure A-3 was an ArcGIS coverage that should have been "turned off" because it identifies all areas of reported instability. In the case of Saint's rest drainage this slide area was the 1981 failure of the dump that was attributed to excessive leach fluid application (5000 gpm applied for 30 days without any solution exiting) and is not foundation related. The area has been stable since being backfilled. Our best estimate of the clay soil extent, based on the available boring logs, is that there are some layers of gravelly clay present as transported residual soils, however, the clay soils do not appear to be as extensive as even the bedrock geology, as some of the bedrock is competent and some areas have been weathered (the clay soil extent is smaller than the extent of the volcanic bedrock).
6	App A Page 12 Para 2	As written "lower permeability values…shown above". Where are the permeability values shown in the report?	Permeability data are summarized in Table B-3 (Appendix B). A discussion of segregation was added and referencing the internal dump stratification model presented in Appendix F
7	App A Page 16 Para 1	As written "…decrease in permeability". What impact will the reduced permeability have on FOS and on water quality/geochemistry?	As indicated in Appendix C, geochemistry, the northern dumps have already been exposed to the most severe level of acid leaching. Therefore we expect little impact due to decrease in permeability on water quality or geochemistry. The reduced permeability may reduce infiltration slightly, but this is a function of controlling surface drainage and fumaroles in the dump. It is KUCC's expectation that conditions in the future will stay the same as they are at present.
8	App A Page 16 Para 2	Dump map is Figure 4 and not figure 3 as written – apparent typo.	Correct reference has been provided.
9	App A Page 18 Para 2	DOGM does not believe that testing to a depth of 16.5 feet is indicative of the surface water infiltration rate throughout the entire column of all the south waste dumps area.	KUCC agrees with the comment on depths and number of investigations. However, the point was that these shallow investigations revealed a surface "base coarse layer." The base coarse was placed across the entire dump surface by mine operations. Otherwise we agree that investigation of just the upper dump surface is not indicative of the entire dump. A discussion has been added describing the general permeability trend versus depth.

10	App A Page 19 Para 1	Plot the results from the leach flow monitoring system using meteoric fluctuations versus time and at a scale the shows the relation of seasonal fluctuations to the surface water infiltration rate, compared to the monitoring system data output.	Figure 5 has been corrected to remove the "planned termination of leaching" and Figure 7 has been added to show the correlation between the Dry Fork total precipitation data and the annual cycles of flow from the dumps for 2002 to 2005. The 2002 to 2005 data set are the most complete and show this trend.
11	App A Page 22 Table 6	See comment 1 listed above (also page 25 paragraph 3).	Added clarification to Appendix A, page 23 of 31 regarding origin of CH / MH soils. These materials appear to be derived from bands of volcanic materials that outcrop below south dumps.
12	App A Page 23 Figure 5	Graph notes in December 99 the leaching termination is "planned". Update graph to 2009 at a scale which would show seasonal fluctuations.	This figure was updated.
13	App A Page 26 Bullet 1	A + (plus) 2 magnitude settlement range is out of the norm. Please explain. DOGM would recommend extending the dump slope stability longer than 3 years. What is KUC's long term dump stability monitoring program?	The actual survey magnitude was +2 inches to – 10 inches, indicating that there is possibly 2 inches of survey error. Agree that it is unlikely that the dumps heaved, but the targets may have heaved. We are just reporting results versus modifying the measurements. KUC long term plan includes surface monitoring, flow rate monitoring, water quality monitoring. An explanation has been added.
14	App A Page 26 Bullet 3,4,5	How will KUC model and monitor the phreatic surface in the foundation materials to ensure long term stability	See item 10. KUCC plans to monitor flow rates. Some further work in possible areas of perched conditions may be completed. The ESCS flows will be monitored continuously.
15	App A Page 26 Bullet 6	As written "figure 2". Which figure 2?	Corrected to Figure 3, this document. This figure is also found in Appendix B.
16	App A Page 27 Table 8	No shear strength parameters are given in table 8; please provide	Table 8 here and elsewhere was modified to include the actual shear strength parameters used, along with a rational of why the values were selected.
17	App A Page 28 Table 9	Is the only geotechnical stability analysis variable not controlled by KUC in the phreatic surfaces? Is no additional loading of the dumps planned? If this is correct, please make this statement in the report and discuss the impact in the text.	If any modifications are made to the current dumps, such as additional loading, such loading geometries will be assessed. KUCC has made and will continue to make efforts to control infiltration into the dumps, and will strive to keep infiltration at or below current levels.

18	App A Omission	What is the FOS used for dynamic design? Include recurrence interval and peak horizontal ground acceleration.	Dynamic stability is considered to be out of scope at this time.
19	App A Omission	Is there any early warning stability problem device; such as a TDR, strain gage array or SSR that is planned for the dumps? Do the dumps justify an early warning monitoring system?	KUCC will consider means to have a "warning system." This may be most applicable to occurrence of debris flow type events. KUC evaluates all systems annual and will consider whether additional dump monitoring systems are warranted under our internal standards. The highest hazard identified is the debris flow hazard, and KUC environmental will perform more frequent inspections after significant meteorological events.
20	App B Page 23 Para 1	It is not clear how the assumption that "it can be safely assumed that the dump factor of safety must be at least 1.2" because there are no present day slope deformations. No slope deformations only indicate that the FOS is greater than 1.0.	Strictly speaking, the FoS provides no analytic information regarding movement or deformation. This factor of safety for the onset of movement is judgment based. Experience demonstrates that small movements do begin to occur at FoS ~ 1.15 to 1.2. Therefore we chose 1.2 as the onset of deformations as there is no evidence of movement based on survey or site inspection. A FoS = 1.0 identifies failure (large deformations) and would be too conservative.
21	App B Page 23 Para 1	It is not clear how the assumption that "a seismic coefficient be included", when no mention is made of the maximum peak particle velocity is at the dump locations. What is the actual PPV at the various dump locations?	In these discussions, a seismic coefficient of up to 0.1 was included to assess the impact of blasting on the back calculated shear strength values of the Cottonwood dumps (on the North side of the pit). The point was that blasting is likely to have impacted the dumps surrounding the pit and back calculation with a seismic coefficient expands the range of cohesive shear strengths that may be present.
22	Supplement of App C Page 2	DOGM does not believe that 8 test pits excavated with a track hoe is representative of the geochemistry of the dumps.	We agree that eight test pits are insufficient, however, there is significantly more proprietary data (see Table B-2 for listing). A sentence has been added to the report which states that the test pit data is consistent with other data collected, especially during dump leaching.
23	Supplement of App C Page 14	How will the chemical reactions and long term pH of the dumps be maintained?	We expect current geochemical reactions to continue well into the future. As stated on page 16,
24	App F	July 29, 2009 debris flow analysis is not labeled as Appendix F.	Corrected.

25	App F Page 3 Para 1	As noted above in comment 1. The Division suggests that KUC considers a more comprehensive risk assessment and design to a 100-year, 24-hour storm. A cost analysis to design to a higher standard might mitigate routine clean out maintenance costs.	KUC will make certain that all debris catch basins meet current minimum regulatory criteria. Where geometrically possible, KUC will increase capacity to meet larger storm events. No matter what capacity the basins are designed to contain, they need to be cleaned out to maintain that capacity.
26	App F Page 21 & 22	Report list "Recommended of Options…" yet there is no mention what KUC will implement to avoid the problem in the future. The section discusses reasons why the possible mitigation methods will not work yet does not give specific recommendations for each case. The Division suggests that KUC consider further Dan-W analyses for other future potential areas, based on the back-calculated variables, and then follow through with specific mitigation actions based the findings from the analyses on the highest risk areas.	The report now highlights the measures that have been implemented. We agree that calibrated Dan-W analyses will continue to be used, as applicable, to evaluate debris flow risk.
27	App F Page 31	Figure A-16 indicates a perched table represented by rilling on the south side of Saints 2 approximately 50% of the distance from the toe to the crest. Is there an explanation for the rilling? Is the area a future problem?	Table 2 has been corrected to reflect the correct name of the dump that failed due to leaching in 1979. The rilling appears to be associated with the backfill location of previous 1979 failure. The rilling is most likely due to head cutting, but could be manifestation of perched water table. We do not believe this is a problem because this area has been stable since being backfilled in 1979. Leaching of the South dumps will not be attempted again due to the high calcium content.
28	App F Page 42	It is unclear why figure B-26 was addressed in appendix F and not in Appendix G. This figure is also shown as figure 2 on page 10 of the report.	Figure B-26 was originally in a separate memo. However, the photograph does represent slippage along an infinite slope condition and is now cross referenced. The discussion of the infinite slope condition is "beefed up" with a cross reference to this figure in Appendix G.
29	App F Page 46	Attachment C – manual is referenced yet not attached, the manual was also listed in the text.	This is an error. The Dan-W Manual is included.

30	App G Page 2 Para 1	Although shallow infinite slope failures are usually ignored, due to the massive size of KUC dumps, the shallow failures can represent a large volume of material. The Division suggests that further analyses are done.	KUC addresses the infinite slope condition as the debris flow "scar" zone and have estimated reasonable values (1000 yd3) for such occurrences. The discussion of the infinite slope is expanded to include effect of cementation, slight (1-2 deg) dump flattening. However, FoS is low for the infinite slope. A discussion of sediment containment has been provided.
31	App G Page 2 1st bullet	As stated "silty clay or silty gravel". The friction angle is considerably less for silty clay. Was there a scientific basis for using the friction angle for silty clay versus the friction angle for silty gravel? It should be stated that both cases were modeled.	The scientific basis is whether the soil is clast or matrix supported. The friction angle / strength used is clarified in the Tables. A site specific stability calculation was added for Yosemite where the FS < 1.0 which demonstrates that the FoS is higher.
32	App G Table G-1	Shear strength parameters are missing out of chart.	Table is corrected here and in the main body of the report.
33	App G Table G-2	Based on Table G-2, KUC should continue further studies at Yosemite to determine the phreatic surface	KUC may complete additional studies, as needed, but does not consider such studies needed to address NOV. Look at stability when screening level analysis indicates low factor of safety.
34	General	Many of the figures are difficult to read due to the scale.	Yes, the GIS based figures are representations of the data available. We have ability interrogate figures in greater detail and could provide larger figures, if absolutely needed. Provide better stability figures. Enlarge drawings to make the stability analysis more visible.
35	General	Is there any economic value to the older historic dumps.	The economic value remaining in any historic waste rock disposal is out of the scope of this analysis